
University of Connecticut
Telecommunications Design Guide & Standards



APRIL 2011

University Information Technology Services

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1 GENERAL REQUIREMENTS

1.1 PURPOSE

The purpose of this document is to provide architects, engineers, designers, and project managers (the Designer) the information necessary for the proper design and construction of a Telecommunication's Structured Cabling System at the University of Connecticut.

A properly designed and constructed Structured Cabling System, based on industry standards, will provide a flexible, efficient, long-lasting, and cost-effective transportation solution for our present and future communication needs. That said, the University of Connecticut recognizes and adopts for itself the Telecommunication Industry's standards and practices as defined and/or interpreted by those agencies listed in section 1.5 and the intent of this document is to identify and define those requirements specific to the needs and practices of the University. The implementation of this design guide and standards will ensure a flexible, uniform telecommunications environment that will allow for the growth of high speed, high bandwidth required by specialized applications used in a higher education environment.

This design guide is a living document; as such, the criteria contained within are subject to revisions and updates as needed due to technological advances within the telecommunications industry.

1.2 DEFINITIONS

To establish a common understanding, this document and the University of Connecticut shall use the following definitions of terms:

UCONN - The University of Connecticut; the owner of all property and completed projects, unless otherwise specified in the project documents. As the owner, UCONN has the right to enforce or modify all applicable codes, standards, and UCONN specific requirements.

UITS - University Information Technology Services; the University's department that is responsible for maintaining all of UCONN's telecommunications systems. As such, UITS shall have final approval of the design, parts, and equipment proposed or installed for UCONN's telecommunications infrastructure and systems.

TELECOMMUNICATIONS – Term used to describe voice, data, and TV services and the infrastructure to deliver them.

SHALL - The term used to denote requirement(s) set forth by UCONN that are not negotiable or arbitrary.

SHOULD - The term used where UCONN strongly recommends certain products or practices.

FURNISH – To supply and deliver the item(s) described to the project site; ready for installation.

INSTALL – To construct, erect, assemble, or place into position the item(s) described; ready for the intended use.

PROVIDE – To furnish and install the item(s) described; complete and ready for the intended use.

REMOVE – To make safe, disconnect, disassemble, deconstruct, and/or remove from UCONN property; to properly and legally dispose.

MAC – An acronym for "Moves, Adds, and Changes" or the post-construction cabling that occurs after the building is occupied.

WAO – An acronym for "Work Area Outlet"; the Telecommunication outlet located at the end user's work area.

VOICE – Equipment and services associated with the delivery of analog, digital, or IP telephony

DATA – Equipment and services associated with connectivity to the local and wide area networks and the internet.



TV – Equipment and services associated with the delivery of *HUSKYvision* broadband cable television solutions.

1.3 SCOPE AND DELIVERABLES

All telecommunication designs and installations for UCONN administrative, academic, residence halls and apartment buildings shall be such that at the completion of the project, UCONN is provided with a complete Structured Cabling System for the error free delivery of voice, data, and TV services to the end user; consistent with the guidelines and standards set forth in this document. Designs and installations shall incorporate existing systems to ensure a seamless co-existence of newly installed and existing systems. Certified personnel as specified in section 1.6 shall perform all designs and installations

UITs is the service provider for all voice, data, and TV at the University of Connecticut. As such, UITs will provide the following:

- All design and installation of the transportation media (i.e. copper, fiber, wireless) necessary to deliver these services to a demarcation point established at the building's Entrance Facility (EF). However, the pathways for the media (i.e. underground conduits, manholes, pole lines, masts) shall be included in the project's scope and budget and their designs part of the Designer's scope of work.
- All telephone sets, equipment (i.e. NT1 cards, power supplies), and cross-connects to deliver voice services to the end user.
- All network equipment (i.e. routers, switches, wireless access points) and cross-connects to deliver network services to the end user.
- All fiber receivers, amplifiers, taps, splitters, and cross-connects to deliver TV services to the end user.

The non-reoccurring installation and equipment costs associated with delivering these UITs services shall be borne by the project or requesting department. Coordinate information with UITs to estimate their values.

The Designer shall provide a design for a complete and functional Structured Cabling System; include equipment, materials, labor, tools, and services. System components include, but are not limited to:

- Raceways, boxes, cable tray, and cable supports
- Wall and floor penetrations and sleeves
- Fire-stopping
- Inside and outside plant cabling
- Line protection
- Splice enclosures
- Balanced twisted-pair cabling, terminations, and splicing
- Optical fiber cabling, terminations, and splicing
- Coaxial cabling, terminations, and splicing
- Work area communication outlets
- Consolidation points
- Cross-connect systems (wiring blocks, patch panels)
- Equipment racks, frames, and cabinets
- Wireless Access Point Enclosures
- Grounding and bonding
- Cable management
- Testing and labeling
- Pre-construction samples and submissions
- As-built documentation
- Removing abandoned cable

Close and careful coordination between UITs and the Designer is required to assure the proper design of the Telecommunication pathways and spaces to include UITs provided cable and equipment.

The Designer shall provide the following:



- A set of “T” series drawings as part of the approved construction documents detailing the Telecommunication Structured Cabling System. These drawings shall be formatted to be consistent with the standards set forth by the University of Connecticut, the American Institute of Architects (AIA) and the latest edition of the BICSI Telecommunications Distribution Methods Manual (TDMM).
- Specifications for all work and materials required to complete the installation of the design. Incorporate these specifications into the project manual; they shall be numbered separately and distinctly from other sections as proposed by the Construction Specifications Institute (CSI) under the 2004 MasterFormat™ (i.e. division 27).
- A budgetary cost estimate of the equipment, materials, labor, and services required to complete the installation of the design.
- A budgetary schedule of events in the form of a Gantt chart that graphically identifies task durations and dependencies and a Network Diagram that identifies the project's critical path.
- Contract Administration in the form of preparing bid documents and evaluating the responses, responding to requests for information (RFI), audit contractor submittals and as-built documentation, attend project coordination meetings, perform QA/QC inspections, create punch lists, and aide in the project close-out processes.

1.4 SPECIFIC MATERIALS

As an effort to reduce maintenance inventory and to provide consistency across the campus, UITS has standardized on specific brands and warranties for Telecommunications Structured Cabling Systems. All designs and specifications shall be based on the following approved manufacturers without substitution:

- Unshielded Twisted Pair (UTP) copper, horizontal and backbone cabling: Hubbell Premise Wiring - (800) 626-0005 www.hubbell-premise.com
- Optical fiber horizontal and backbone cabling: Corning Cable Systems – (800) 743-2671 www.corning.com/cablesystems
- Open frame racks, cable management, and ladder racks: Chatsworth Products, Inc. – (818) 735-6100 www.chatsworth.com
- Enclosed equipment racks: Wright-Line – (800) 225-7348 www.wrightline.com (Paramount Series)
- Surface Metal Raceways: Wiremold – (877) 295-3472 www.legrand.us/Wiremold.aspx

All materials, equipment, hardware, and components shall be new and free from defects in materials, composition, and installed workmanship. Materials and equipment shall be installed, placed, terminated, tested, handled, and processed in a manner consistent with manufacturer's instructions.

1.5 REGULATORY REQUIREMENTS, CODES AND STANDARDS

All designs shall be in compliance with the following codes, industry standards, and practices, as well as, UCONN specific requirements described in this document. It is the responsibility of the designer to know and comply with the most current revisions of each document referenced below:

Connecticut Department of Public Safety State Building Code – 2005 Connecticut Supplement, 2009 Amendment

ANSI/IEEE 802 series of standards for Local Area Networks and Wide Area Networks

ANSI/NFPA-70 - National Electrical Code (NEC)

ANSI/IEEE C2 - National Electrical Safety Code (NESC)

ANSI/IEEE 1100 2005 - Recommended Practice for Powering and Grounding Electronic Equipment (IEEE Emerald Book)

ANSI/NECA/BICSI-568 – Standard for Installing Commercial Building Telecommunications Cabling

ANSI/TIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises



ANSI/TIA-568-C.1 – Commercial Building Telecommunications Cabling Standard

ANSI/TIA-568-C.2 – Balanced Twisted Pair Telecommunications Cabling and Components Standard

ANSI/TIA-568-C.3 – Optical Fiber Cabling Components Standard

ANSI/TIA-569-B – Commercial Building Standard for Telecommunications Pathways and Spaces

ANSI/TIA-606-A – The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

ANSI-J-STD-607-A – Commercial Building Grounding and Bonding Requirements for Telecommunications

ANSI/TIA-758-A – Customer-Owned Outside Plant Telecommunications Cabling Standard

ANSI/TIA-862 – Building Automation Systems Cabling Standard for Commercial Buildings

ANSI/TIA-942 – Telecommunications Infrastructure Standard for Data Centers

Telcordia SR-1421 – Blue Book, Manual of Construction Procedures

Hubbell Premise Wiring – MISSION CRITICAL™ Extended Warranty Program

Corning Cable Systems – LANscape™ Extended Warranty Program

All codes, industry standards and practices, and UCONN specific requirements shall be enforced, however, where they conflict, the more stringent or UCONN specific requirements shall apply.

1.6 CERTIFICATION REQUIREMENTS AND DOCUMENTATION

The Designer shall be competent in the field of Telecommunications design. (S)He shall demonstrate at least three years of experience in Telecommunications design and specialized education in this field as well. Acceptable evidence is that the Designer be a BICSI certified Registered Communications Distribution Designer (RCDD) or equal. The Designer shall also be a professional, licensed by the State of Connecticut to perform this function (i.e. PE or TLT).

The Contractor shall be competent in the field of installing Structured Cabling Systems as well. (S)He shall show at least three years' experience in this field and provide customer references for work recently completed. The Contractor shall show proof they are certified by the cabling connectivity manufacturer to support the manufacturer's extended warranty program and of training to all their installers by the manufacturer offering the extended warranty program. As a plus, the Contractor should provide installers and supervisors that have received specialized training in installing Structured Cabling Systems by a vendor neutral organization such as BICSI. The Contractor and his(er) installers shall be properly licensed by the State of Connecticut to install Structured Cabling Systems.

1.7 WARRANTY

The Contractor shall provide UCONN a warranty for performance of the Structured Cabling System and against defects in materials and workmanship for a period of no less than one year after close of the project. All material, labor, and expenses to correct the problem(s) are to be included in the warranty.

The Contractor shall enroll the installed Structured Cabling System into the cabling component manufacturer's extended warranty program. They shall provide UCONN with a certificate of warranty from the manufacturer valid for a period of no less than twenty-five years. All materials, labor, and expenses to correct the problem(s) shall be included in the warranty.

1.8 PERFORMANCE REQUIREMENTS

Design the Structured Cabling System to meet the following minimum requirements:

- UTP Horizontal Permanent Links: Category 6
- UTP Backbone Cabling: Category 3



- Optical Fiber Backbone Cabling and Permanent Links: ITU-T G.652.D compliant Full Spectrum Singlemode (OS2)
- Coaxial Horizontal Permanent Links: Series 6 (RG6) Quad-shield; tested to 3GHz
- Coaxial Backbone Cabling: .500" Parameter III

1.9 GROUNDING

Provide a low-impedance Telecommunications Grounding System in accordance with ANSI-J-STD-607-A – Commercial Building Grounding and Bonding Requirements for Telecommunications. The Telecommunications Main Grounding Busbar (TMGB) shall be located in the Equipment Room; in close proximity to the Entrance Facility; bonded in accordance to NEC Art. 800.100. Size the TMGB to provide enough points of attachment for each bonding connection plus 10% growth. The minimum size for the TMGB is ¼"W X 4"H X 12"L. Provide a Telecommunications Grounding Busbar (TGB) in each Telecommunication Room. The TGB shall be located high on the wall just below the overhead ladder racking. Size the TGB to provide enough points of attachment for each bonding connection plus 10% growth. The minimum size for the TGB is ¼"W X 2"H X 12"L. Provide a grounding busbar ¼" W X 5/8"H X 72"L mounted vertically along the backside of each ER equipment rack and each TR equipment rack provisioned with power for active electronic equipment.

1.10 ADMINISTRATION

Identify and label each Equipment Room and Telecommunication Room with a unique identifier derived from the UCONN's FAMIS facility management database. The labels shall be permanent and consistent with the labeling style established for the building. Along with the room number the label shall include "TEL/DATA" as the use describer.

110

TEL/DATA

Identify and label each Equipment Rack with a unique identifier that includes the Telecommunication Space FAMIS room number followed by a hyphen then a single numeric character. The labels shall be engraved plastic; the font shall be at least 1 inch high and contrasting the background in color. Securely attach the label to the front of the ladder rack; directly above the equipment rack.

110-1

Identify and label each Wall with a Plywood Backboard with a unique identifier that includes the Telecommunication Space FAMIS room number followed by a hyphen then a single alpha character. The labels shall be engraved plastic; the font shall be at least 1 inch high and contrasting the background in color. Securely attach the label to the front of the ladder rack directly; above the plywood backboard.

110-A

Identify and label each Patch Panel and Wiring Block with a unique identifier that includes the Equipment Rack or Plywood Backboard identifier followed by a single alpha character. The labels shall be durable, machine generated, self-adhering, at least 3/8" wide; the font shall be a minimum of 3/16" high and contrasting the background in color. Affix the labels to the front of the patch panel or wiring block so that they will remain clearly visible once cross-connects or patching is completed.

110-1A (rack-mount patch panel)

110-AA (wall-mount wiring block)

Uniquely identify and label each Backbone Cable as to reference its source and destination termination patch panel or wiring block, the cable's type and size. The labels shall be durable, machine generated, self-adhering, at least 3/8" wide; the font shall be a minimum of 3/16" high and contrasting the background in color. Affix labels at the end of the cable within 12 inches of termination and on each patch panel or wiring block.

001-AA/110-AA 100-3-UTP (UTP copper backbone)



001-1A/110-0A 12-SMF (fiber backbone)

001-AB/110-AB P3-500 (coaxial backbone)

Uniquely identify and label each Permanent Link as to reference its source termination patch panel port or wiring block position. The identifier shall include the patch panel or wiring block identifier followed by a two digit port or position number. The labels shall be durable, machine generated, self-adhering, at least 3/8" wide; the font shall be a minimum of 3/16" high and contrasting the background in color. Affix labels at the end of each cable within 12 inches of termination and to the front of the faceplate near the connector module.

110-1A01

All identifiers shall be clearly recorded on the as-built drawings.

As part of the close-out documentation, provide UITs with a table that shows the relationship of each permanent link, by its identifier, to the FAMIS room number of the TR and the FAMIS room number where the WAO is installed.

2 INSIDE PLANT

2.1 TELECOMMUNICATIONS PATHWAYS AND SPACES

Pathways and spaces identified for Telecommunication use shall be dedicated solely for that purpose. Concerns for network security, complexity of the systems, sensitivity to alien interferences (i.e. static electricity, RF, or EMI), power quality, and special environmental requirements make it necessary that telecommunications equipment and cabling to be the sole occupant of these pathways and spaces.

Telecommunication Spaces (ER, TR) shall be directly accessible from main corridors; technicians shall not have to pass through other spaces, such as offices or mechanical rooms, to access Telecommunication Spaces. The doors shall be locked and keyed to UITs specified keys for Telecommunication Spaces. The rooms shall be clearly labeled as a Telecommunications Space.

Provide enough space for all equipment located within the Equipment and Telecommunications Rooms and offer a safe working environment for technicians. Codes and standards establish minimum working clearances, but considerations shall be given to the layout and for space that allows a technician with a tool belt to work safely around active equipment without having to step around or over cords, cables, and equipment or accidentally disconnecting equipment.

As buildings become "Smarter", more and more services are becoming dependent on the local area network for their communication needs. As a result, it has become a critical function of the university to keep the network up and running. Power availability and quality are significant components to that equation. UCONN has deemed that Telecommunications is an "EMERGENCY SERVICE" and that it must be made highly available. The Designer shall include a back-up power source with a UPS solution in the design for powering the Equipment and Telecommunications Rooms. UITs strongly recommends that a centralized UPS and power distribution system be provided for all telecommunication spaces. Provide branch circuits for telecommunications equipment as noted below. In addition, provide at least one 120VAC 20A outlet in each room from normal building power for maintenance operations.

The designer shall include a solution for the room's environmental needs, utilizing practices and standards set forth by ASHRE. Equipment and Telecommunications Rooms shall maintain temperatures and humidity levels within the recommended limits of the telecommunication equipment manufacturers, as well as the ventilation of any accumulated fumes and gasses.

Where Equipment and Telecommunication Rooms contain a significant volume of data equipment (i.e. Data Center, Server Farm, Network Distribution Layer Node) or service a large portion of the buildings needs the designer should include a pre-action solution for the fire suppression system.

Provide equipment racks in quantities and types as described below. Racks shall be of a high strength extruded aluminum construction with a black powder-coat finish; standard TIA 19"



design with #12-24 threaded holes space according to the EIA-310-D Universal Hole pattern on both the front and rear of the rails. The rails shall be labeled along the front to identify the Rack Mount Unit (RMU, 1.75") spaces. Racks shall be 7 foot tall providing 45-RMU of mounting space. Provide cable management troughs with rounded "waterfall" edges at the top of each rack. The racks shall be securely fastened to the floor and to the ladder racking above. Mount racks side-by-side in continuous row with 10" wide vertical cable management in between each pairing of racks and 6" wide vertical cable management at the outside of the row. Vertical cable managers shall be 7 foot tall with deep "T" shaped rigid cable guides spaced at 1-RMU increments; they shall have hinged covers that open to the left or right by a single control action; Chatsworth Products, Inc. EVOLUTION™ series or equal. Provide double sided vertical cable managers with two-post racks and single-sided with four-post racks.

2.1.1 Entrance Facility

For the purposes of this document, the Entrance Facility (EF) is the service lateral conduits that provide a pathway from the nearest UCONN telecommunications manhole to the building Equipment Room and the location within the Equipment Room where UITS will terminate their outside plant service providing cables.

Provide a minimum of two trade size 4 conduits from the nearest UCONN telecommunications manhole to the building's Equipment Room. Where the purpose of the building, either whole or in part, is to serve the telecommunications needs of other buildings (i.e. SLC site, Network Distribution Layer Node, Wiring Center) provide six trade size 4 conduits. Refer to section 3 for installation requirements.

For line-protection and splicing of the UITS copper cable(s), provide two 4' X 8' X ¾" fire-retardant plywood next to the entrance facility conduits.

For terminations and splicing of the UITS optical fiber cable(s) provide one four-post Equipment Rack; Chatsworth Products, Inc. QUADRARACK™ or equal.

2.1.2 Equipment Room

The purpose of Equipment Room (ER) to serve as the building distributor for Telecommunication services; it shall be located as close as practicable to the main electrical service. Located within the ER shall be the EF; the TMGB; terminations for all Telecommunication Backbones; Telecommunications Equipment that serve the building (i.e. ISDN NT1's, telephone power supplies, routers, switches, servers, broadband amplifiers). Where the size of the building is such that it only requires one Telecommunications space, the ER may also serve as the TR.

Provide overhead ladder racking around the perimeter of the ER and over each Equipment Rack. This ladder rack shall be sized to accommodate the orderly distribution of cable within the room, but shall not be less than 12" wide. Install the ladder rack approximately 7'-6" AFF. Provide "waterfall" cable guides over each vertical cable manager and vertical cable route to protect the cables' bend radius.

Locate the UTP copper and P-III coaxial backbone terminations on the plywood back board near the OSP line-protection.

For terminations and splicing of the building backbone optical fiber cable(s) provide (1) four-post Equipment Rack; Chatsworth Products, Inc. QUADRARACK™ or equal. Locate this rack next to the EF rack.

Provide two 120VAC 20A branch circuits with two NEMA 5-20R duplex receptacles each from the Telecommunications power supply; one circuit at the plywood backboard and the other at the equipment rack.

2.1.3 Telecommunications Rooms

The purpose of the Telecommunication Room (TR) to serve as an area or floor distributor for Telecommunication services; it shall be located near the center of the area/floor served. In a multi-story building the TR's should be located as to stack one directly above the other. The area served by the TR and the location of the TR shall be such that no permanent link exceeds 90 m (328 ft.) in total length. Located within the TR are the



termination fields for the permanent links and backbone cables, the TGB, active and passive equipment racks, the Telecommunications equipment to serve the area.

At least two walls of the TR shall be covered with $\frac{3}{4}$ " fire-retardant plywood from the floor to a height of 8'-0" AFF.

Provide overhead ladder racking around the perimeter of the TR and over each Equipment Rack. This ladder rack shall be sized to accommodate the orderly distribution of cable within the room, but shall not be less than 12" wide. Install the ladder rack approximately 7'-6" AFF. Provide "waterfall" cable radius bend protection over each vertical cable manager and vertical cable route to protect the cables' bend radius.

Provide a minimum of two two-post equipment racks in each TR to house all cable terminations and Telecommunications equipment. The rack loading shall be designed so as not to exceed 80% (32-RMU) usage of the available space.

Provide an intra-TR backbone in each TR. An intra-TR backbone is a category 3 UTP backbone from the plywood backboard, near the UTP backbone, to the equipment rack. This backbone terminates to a 110-type wiring block on the plywood backboard and to 48-port T568B patch panel(s) on the equipment rack. Equip the 110-type wiring block with 110-C4 connector blocks. This backbone shall be sized in 48 port increments so as to provide 1.1 patch panel ports (4-pairs per port) for each standard and wallphone WAO served from the TR.

Provide one 120VAC 20A branch circuit with two NEMA 5-20R duplex receptacles from Telecommunications power supply at the plywood backboard near the intra-TR backbone termination field. Provide two 208VAC 30A 3-phase branch circuits with NEMA L15-30R receptacles from Telecommunications power supply for each equipment rack with active electronic equipment.

2.1.4 Telecommunication Pathways

Information technology is forever changing. As such, the media infrastructure for this technology must develop and change to keep pace; as it provides the "highways" to transport these services to our customers. The question that keeps reoccurring is "How do we future-proof our building against the costs associated with these changes?" The answer comes with well designed and built Telecommunication Pathways such as cable trays, conduits, ring-runs, and sleeves. A Telecommunication Pathway should provide ease of access for the installer to minimize damage to the building and ease installation to reduce labor costs. The pathway should also be of sufficient size to accommodate future cabling needs such as MAC cabling for personal changes or wholesale media upgrades. With this in mind, include the following points in designing the Telecommunications Pathways.

Cable supports shall be wide-based and close enough together to prevent distortion to the cables' geometry from the weight of other cables on piled top and excessive cable drooping.

Provide oversized or additional sleeves through common pathway walls and floors such as the ones for the TR or along the major cable paths.

Provide conduits through non-accessible spaces like fixed or gypsum ceilings.

In areas where horizontal cables aggregate into the TR provide cable tray.

Design the telecommunications pathways to run parallel with or perpendicular to the lines of the building. Cables shall not be run through ceiling spaces in an "as the crow flies" manor.

All through-wall and through-floor penetrations for the Telecommunications Pathway shall be sleeved and properly fire-stopped.

Provide pull-strings in conduits and cable tray for future cable installations.



2.1.4.1 Backbone Pathways

Backbone cabling pathways shall be clearly identified as such designed to provide adequate space and protection for the backbone cables, and allow room for future growth; recommended is a cable tray or conduits. Where backbone cables pass vertically through stacked TR's, provide a ladder rack vertically mounted from floor to ceiling for cable support. Where possible, the pathway should extend to the roof to accommodate future cabling needs.

2.1.4.2 Horizontal Pathways

Cable pathways shall be accessible and should follow the corridors of the building. Where cable tray or conduit is not specified, a continuous pathway of independent cable supports shall be provided.

2.1.4.3 Work Area Outlet Boxes

WAO boxes concealed within wall spaces shall be a minimum of 4-11/16"H x 4-11/16"W x 2-1/8"D with a single gang plaster ring. Each outlet box shall have a minimum trade size 1 conduit stubbed to an accessible ceiling space or cable tray. Conduit openings shall be bushed to protect cables from damage.

2.1.4.4 Surface Mounted Raceway

Raceways shall be metallic and sized to accommodate the number of cables specified for installation. They shall maintain proper cable bend radii and provide room for additional fill. Provide split or dual channel raceway for installations that require both power and telecommunication services to share the raceway.

2.1.4.5 Modular System Furniture and Paneling

Modular system furniture and paneling shall accommodate UCONN specific materials and not require the use of proprietary cabling components. They shall have integral raceways that conceal telecommunication cables without distorting or damaging them or compromising cable bend radius requirements. System furniture raceways shall have metal barriers to separate telecommunication cables from power cables.

2.2 BACKBONE CABLING

2.2.1 UTP Copper Backbone

Provide a UTP copper backbone cable from each TR back to the ER. The cable shall be, at a minimum, category 3 and UL listed to be installed in an environmental return-air plenum space (CMP).

Size the UTP copper backbone in 100 pair increments so as to provide at least 2.3 pairs for each standard and wallphone WAO served.

Terminate the cable(s) to wall-mount 300-pair 110-type wiring block(s) in the ER and TR. The 110-type wiring blocks shall be equipped with 110-C5 connector blocks. Provide cross-connect wire management above and below each 110 wiring block.

Each cable pair shall be tested for point-to-point continuity. This includes testing to certify correct wire mapping and to insure there are no opens, shorts, crosses, or grounds. As part of the close-out documentation provide UITS the testing equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.2.2 Optical Fiber Backbone

Provide a singlemode optical fiber backbone from each TR back to the ER. The cable shall be of a tight-buffer construction with an aluminum interlocking armor jacket and UL listed to be installed in an environmental return-air plenum space (OFCP). The fiber shall be ITU-T G.652.D compliant Full Spectrum Singlemode (OS2).



Size the optical fiber backbone in 12-fiber increments so as to provide at least 8 fibers per application (UTS typically has one application per TR).

Terminate fiber cables by fusion-splicing pigtail cable assemblies to the cable ends. The pigtail cable assemblies shall be factory terminated with SC/APC connectors. Protect the fusion-splices with reinforced heat-shrink sleeves and place them in splice trays. Provide rack-mount patch panels with SC-APC couplers and storage for splice trays. Where fiber backbone cables terminate on four-post racks; fiber patch panels shall be mounted on the front side of the rack and splicing cabinets on the rear.

Optical fiber testing shall be performed in accordance with ANSI-TIA/EIA-568 C.0 and C.1. Perform a Tier 1 (LS/PM) test on each optical fiber. Fibers that are spliced, with other than pigtail splicing, shall also undergo a Tier 2 (OTDR) test. As part of the close-out documentation provide UITS the test results of each fiber along with the testing equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.2.3 Coaxial Backbone

Provide a Coaxial Backbone from the plywood backboard in each TR back to the plywood backboard in the ER. The cable shall be a .500" Parameter III coax distribution cable and UL listed to be installed in an environmental return-air plenum space (CATVP).

Terminate each cable end with F81 bulkhead connector. All connectors shall be terminated with OEM specified tools. Provide and neatly store 10 feet of additional cable at each location.

Test the following parameters of each cable: Continuity, length, and insertion loss. Testing shall be done in accordance to OEM requirements for warranty. As part of the close-out documentation provide UITS the test results of each coaxial cable along with the testing equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.3 HORIZONTAL CABLING (PERMANENT LINKS)

All horizontal cabling, including video cabling, shall be distributed in a star configuration; running from the WAO back to the serving TR. See below for specific requirements.

2.3.1 UTP Permanent Links

Cables shall be solid copper conductors, 22 AWG to 24 AWG, 100 Ω balanced unshielded twisted-pair (UTP) Enhanced Category 6 cables with four individually twisted-pairs, which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA-568-C.2; tested to at least 550 MHz, minimally compliant category 6 cables shall not be accepted. The color of the cable's outer jacket shall be WHITE. Cables shall be UL listed for the application and environment for which they are installed with the following modification: *cables installed in residence buildings and places of public assembly shall be, at a minimum, UL listed to be installed in an environmental return-air plenum space (CMP).*

Modular Connectors (Jacks) shall be category 6; "Keystone" in design; wired T568B; and meet or exceed the mechanical and transmission performance specifications in ANSI/TIA-568-C.2. The color of the jacks shall match the color of the mounting frame and the nearby electrical outlets.

Patch Panels shall be category 6; wired T568B; 48 port; 2-RMU; designed to mount on a standard TIA 19" frame; and shall meet or exceed the mechanical and transmission performance specifications in ANSI/TIA-568-C.2; color BLACK. Each port shall be uniquely and permanently numbered from the manufacturer.

Test each permanent link as a complete horizontal cabling system, with jacks and faceplates completely assembled and properly mounted in their final position. Perform permanent link field tests with a Level III field tester; in accordance to test unit



manufacturer instructions. Field-test each category 6 permanent link in accordance with ANSI/TIA-568-C.0, ANSI/TIA-568-C.1 and ANSI/TIA -568-C.2, including their addenda. UCONN will accept only those permanent links whose field-test results with a PASS. Permanent links with a field-test result of FAIL or *PASS will be rejected. Store and identify test results by the permanent link identification as shown on the contract drawings. As part of the close-out documentation provide UITS the test results and the testing equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.3.2 Optical Fiber Permanent Links

Cables shall be of a fan-out type construction with a minimum 2.0mm outer jack and high-strength reinforcing fibers protecting each fiber. The cables shall contain four Singlemode (OS2) fibers which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA-568-C.3. The color of the cable's outer jacket shall be YELLOW. Cables shall be UL listed for the application and environment for which they are installed with the following modification: *cables installed in residence buildings and places of public assembly shall be, at a minimum, UL listed to be installed in an environmental return-air plenum space (OFNP).*

The fibers shall be field terminated high performance, no epoxy/no polish small form factor LC connectors which meets or exceeds the mechanical and transmission performance specifications in ANSI/TIA-568-C.3. Adaptor modules shall be flush mount duplex LC and produced by the same manufacturer of the UTP modular connectors. The color of the modules shall match the color of the mounting frame.

Test each permanent link as a complete horizontal cabling system, with connectors, adaptors, and faceplates completely assembled and properly mounted. Perform permanent link field tests with a Level III field tester; in accordance to test unit manufacturer instructions. Field-test each fiber permanent link in accordance with ANSI/TIA-568-C.0, ANSI/TIA-568-C.1 and ANSI/TIA -568-C.3, including their addenda. UCONN will accept only those permanent links whose field-test results with a PASS. Permanent links with a field-test result of FAIL or *PASS will be rejected. Store and identify test results by the permanent link identification as shown on the contract drawings. As part of the close-out documentation provide UITS the test results and the testing equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.3.3 Coaxial Permanent Links

Cables shall be Series 6 (RG6) Quad-shield coaxial construction; 75Ω unbalanced video cable; 18 AWG copper-clad steel center conductor; Foam dielectric; Aluminum foil - 60% braid – foil – 40% braid shield; factory tested to 3GHz. Cables shall be UL listed for the application and environment for which they are installed with the following modification: *cables installed in residence buildings and places of public assembly shall be, at a minimum, UL listed to be installed in an environmental return-air plenum space (CATVP, CMP).*

Terminate each end of the coaxial cable with an F-type compression connector. Positive compression type connectors with minimal signal leakage characteristics shall be installed with OEM installation tool. Hex crimp connectors are not acceptable.

At the TR the cable shall be connected to an F-81 ground block orderly and securely mounted to the plywood backboard. At the WAO the cable shall be connected to an F-81 adapter module. . The color of the modules shall match the color of the mounting frame.

Test each permanent link as a complete horizontal cabling system, with connectors, adaptors, and faceplates completely assembled and properly mounted. Test the following parameters of each cable: Continuity, length, and insertion loss. Testing shall be done in accordance to OEM requirements for warranty. As part of the close-out documentation provide UITS the test results of each coaxial cable along with the testing



equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.4 WAO DESIGN CONSIDERATIONS

2.4.1 Mounting Frames and Faceplates

Connector modules and adapters shall be installed in a NEMA standard rectangular (Style Line®, GFCI) shaped plastic mounting frame. The frame shall be the rear-loading type and of the same manufacturer as the connector and adaptor modules. The color of the frames should match the color of the nearby electrical outlets.

Faceplates shall accommodate the rectangular mounting frames and shall match the nearby electrical outlet faceplates in appearance. The faceplates shall have provisions to affix and display labeling for the connector or adaptor modules.

2.4.2 Definitions for Commonly Used WAO's:

Standard WAO – shall have a three port rectangular frame and faceplate with three UTP permanent links. The topmost port is typically reserved for voice applications and the remaining two ports for data.

Wallphone WAO - shall have one UTP permanent link. The wallphone faceplate shall be made of stainless steel with a brushed finish and shall have two mounting posts that accommodate a standard wallphone. The faceplate shall be rear loading with a recessed port opening.

2-Port WAO – shall have a two port rectangular frame and faceplate with two UTP permanent links.

TV WAO - consists of a one port rectangular frame and faceplate with one Coaxial permanent link.

2.4.3 Program Space WAO Requirements:

The following are minimal WAO requirements based on typical program spaces. Additional WAO may be required for ancillary devices (printers, fax machines, etc.), specific needs of the occupant(s), and size or intended use of the room. Each WAO should be located near an electrical power outlet.

Faculty/Staff Office: Two Standard WAO on opposing walls

Dean/Director Office: Three Standard WAO on opposing walls and one TV WAO.

Clerical Staff and Graduate Student Work Area: One Standard WAO for each desk or workspace.

Conference Room: Two Standard WAO on opposing walls and one TV WAO.

Lounge or Break Room: One Standard WAO and one TV WAO. Considerations should be given to mount the TV WAO high on the wall or in the ceiling for wall-mount televisions.

Computer Lab: One 2-Port WAO for every two computers, one TV WAO, one Wallphone WAO located near the door.

Research / Laboratory: One 2-Port WAO for each work station, one Wallphone WAO located near the door.

Classrooms: Two Standard WAO; one near the teaching station and one on an opposing wall; one TV WAO at the front of the room; one Wallphone WAO located near the door. UCONN's Institute for Teaching & Learning (ITL), AV Technology Services Division (AVT) supports all Hi-tech Classrooms and shall be consulted for additional WAO and AV requirements. Contact information can be found at <http://itl.uconn.edu/avtechnology/>.

Student Housing: One 2-Port WAO per bed and one TV WAO per room. Provide one Standard WAO and one TV WAO in suite scenario common area.



2.4.4 Electronic Surveillance and Security (ESS)

Provide one UTP permanent link for each door access controller and CCTV camera. ESS permanent links shall terminate to a separate patch panel field in the TR.

2.4.5 Building Automation Systems (BAS)

The following are BAS services that typically require dial-up or network connectivity. Provide permanent links as noted:

- Elevator: Two UTP permanent links
- Fire Alarm Control Panel: Four UTP permanent links, and one Optical Fiber Permanent Link
- HVAC (Andover Controls): One UTP permanent link
- Power Metering (Square D Power Logic): One UTP permanent link
- Sewage Pumping Station (WPCF SCADA): One UTP permanent link

BAS permanent links shall terminate to a separate patch panel field in the TR. The BAS patch panel shall be of the modular, multimedia type, 24 or 48 port; the connector and adaptor modules in the TR shall be black.

2.4.6 Wireless Network Access (WLAN)

UITs provides wireless network access (IEEE 802.11a/b/g/n) via a Cisco Unified Wireless Network consisting of WLAN controllers and CAPWAP access points. . The Designer shall conduct an engineering study to establish the best location for each access point in order to provide optimum wireless coverage. Provide one UTP permanent link and a ceiling mounting enclosure for each wireless access point. UITs will provide the wireless access points (Cisco AIR-CAP35021-K910) and Power-over-Ethernet (PoE) power sources. The engineering study shall meet the following RF specifications as a minimum requirement for delivery of voice and video quality IEEE 802.11 services as defined by Cisco Systems:

- Optimal Cell Boundary of the wireless access point shall be -60db measured by the client adapter; or equivalent client association rate
- 20% cell overlap based on the optimal cell boundary to ensure smooth client roaming
- Latency shall be no less than 150 seconds
- Packet loss shall be no more than .05%
- Packet jitter shall have a value no more than 10

3 OUTSIDE PLANT

As stated in section 1.3, UITs is UCONN's service provider for voice, data, and TV to the Storrs Campus and as such, UITs provides the outside plant media to deliver these services. However, the Designer must include within the project's scope and budget the pathways necessary to deliver these services to the building. Typically, all pathways are underground duct banks; UITs requires a minimum of six trade size 4 conduits for feeder and distribution ducts, ducts that run from manhole to manhole, and two trade size 4 conduits for the service laterals, ducts that run from manhole to building. Feeder and distribution ducts are organized in a three-over three fashion. All underground duct banks shall be encased in concrete. Manholes shall be spaced so that the duct banks between them do not exceed 600 feet in length and the sum of all bends shall not exceed 180°. Service laterals shall not exceed 300 feet in length. However, conditions may vary and these requirements may need to be modified. Coordinate with UITs to insure these pathways are of adequate size and configuration or if other pathway solutions or cabling requirements are needed.

The following are specifications that are part of the UITs's Outside Plant Design Package for Underground Duct banks:



3.1 GENERAL

Visit the project location prior to the start of the project; examine and evaluate all existing conditions. Included in this project's Scope of Work are the processes, equipment, services, materials, and labor necessary for the safe, timely, orderly, and proper completion of the project.

All measurements are approximate. Verify all dimensions with field conditions.

The locations of all underground structures shown here in are according to the best available information. They are not guaranteed to be correct or complete.

Do not deviate from these plans without first gaining approval of the University Information Technology Services (ITS) project manager.

Arrange to have all utilities identify their positions in the field before starting excavation; "Call-Before-You-Dig" (800) 922-4455.

Protect all monuments and bench marks.

Protect all plants and trees and their root systems from mechanical and environmental damage during excavation. Excavation is not allowed within the drip-line of any tree without prior written approval from UCONN.

Unless otherwise noted, maintain the following minimum clearances:

Utility	Crossing	Parallel
Gas Main	12"	30"
Gas Service	12"	12"
Water	12"	18"
Steam	18"	48"
Electric	12"	12"
Storm & Sanitary	12"	12"

Unless otherwise noted, maintain the following minimum buried depths. Measure from the top of the structure to the nearest portion of finished grade:

Structure	Depth
Duct Bank	30"
Manhole	12"

3.2 MATERIALS

Manholes: 38Y (Splay), "J"-type, made of precast concrete with the minimum interior dimensions of 6'W X 12'L X 7' H (see the attached drawing for details). Provide cast iron rings and covers; load rated H-20 with a minimum diameter of 32 inches. Covers shall be labeled "TELEPHONE" or "COMMUNICATIONS".

Non-Metallic Conduit: Rigid Polyvinyl Chloride Conduit (PVC), Telephone Duct Type-C, designed for direct burial or concrete encasement applications; RUS listed, meets or exceeds the requirements of NEMA TC-10 and Bellcore CAO 8546. Fittings shall match requirements for conduit.

Metallic Conduit: Rigid Metal Conduit, Steel, ANSI C80.1, Hot Dipped Galvanized interior and exterior, NPT threads, ANSI B1.20.1. Fittings shall match requirements for conduit.

Conduit Spacers: Carlon "SNAP-N-STACK" SP4W20-2 or equal. Spacers shall maintain a minimum 2" wall-to-wall separation of conduits in all directions and elevate bottom conduits a minimum 3" above trench floor. Maximum spacing between spacers: 7'-0"



Concrete: Encase conduits in concrete having nominal compression strength of 2500lbs/sq.in, with 3/8" maximum aggregate crush stone or washed gravel. (Concrete slump size: 6" min., 8" max.).

Tracer Wire: Minimum - #12AWG solid copper conductor insulation type UL listed THWN (Gas & Oil Resistant).

Tracer Wire Access Box: Provide grade level access to each end of the tracer wire. ABS tubular valve box with Cast iron cover, color: Orange, accessible via standard pentagonal key. Tracer wire lug attached to underside of cover; rated for road surface applications. Install per manufacturer's instructions in close proximity to manhole cover with a maximum separation shall not exceed 500' between boxes (i.e. Copperhead Industries, LLC "Snake Pit Magnetized Tracer Box" series or equal)

Utility Marker Ball: 3M™ EMS 4" Extended Range 5' Ball Marker - Telephone 1401-XR

Muletape: Flat, woven, polyester tape with a pulling strength of 1250lbs. Pre-lubricated for easy pulling and durably printed with sequential footage markings (Neptco or equal).

Duct Plugs: Blank duct plugs made of corrosion resistant high-impact plastic. Center washer expands when tightened to prevent water and sediment infiltration; provided with eyelet to secure pull rope (Tyco Electronics "Jack Moon" or equal).

3.3 DUCT BANKS

All Duct Banks shall be constructed of concrete encased non-metallic conduit. All bends shall have a minimum radius of 36 inches. Utilize manufactured bends where ever possible. Where bends are performed in the field, protect conduits against kinks or distortion of shape.

Feeder and Distribution ducts shall enter on the narrow walls of the manholes. Ducts providing Service Laterals to buildings may enter on the long walls.

Ducts shall not enter the manhole in the cover chimney.

Conduits shall enter manholes perpendicular to the wall

Utilize installed TERMADUCTS for all conduits entering the manhole wherever possible. Populate the lowest knock-outs available to allow for future expansion. Conduits shall be installed flush with the interior wall of the manhole and shall not protrude into the interior space.

Splay all conduits entering the narrow wall of Telecommunication Manholes. Equally separate duct banks so that half the conduits will enter near the left corner of the narrow wall and the other half will enter near the right corner of the same narrow wall. The splaying of the conduits should start at least 20' from the manhole. Service lateral ducts are not required to be splayed.

Where possible, organize conduits in such a manner as to provide "in-line" or "pull-through" cable installations.

Provide #6 X 12" steel reinforcing bars inserted into manhole walls prior to concrete encasement of duct bank.

At all road and driveway crossings the duct bank concrete shall be reinforced with engineer designed steel reinforcement.

Provide Rigid Metal Conduit at the entrance to each building starting at 10' (min.) outside the foundation wall to termination in the Equipment Room. Bond the conduits to the TMGB with a #6 AWG copper ground wire and bonding bushings.

Patch walls around conduit entrances with hydraulic cement or watertight grout to prevent water infiltration. Seal all conduit entrances into a below grade building space with a mechanical modular sealing system (Link Seal® or equal).

Cement all non-metallic conduit joints using a PVC primer and solvent cement.

All underground conduits shall be encased in concrete. Work concrete to remove all trapped air and insure each conduit is completely surrounded by a minimum 2" of concrete. Allow concrete to cure for at least one hour before backfilling.



Seal all conduit ends with blank duct plugs. Secure Muletape to duct plug.

3.4 TRAFFIC & SAFETY

Provide signs, barricades, drums, traffic cones, fencing, delineators, and traffic control officers to maintain a safe "WORK ZONE", insure safe traffic patterns, and restrict public access to the work site.

Coordinate work schedule with UITs project manager to maintain building access and minimize traffic disruptions.

Provide shoring and exercise safe trenching practices as required by OSHA.

3.5 BACKFILL

Provide a tracer wire on top and along the centerline of duct bank.

The first 12" of fill shall be sand or other granular material tamped using lightweight equipment such as pneumatic or vibrating tampers.

Install Utility Marker Balls above duct bank at intervals not exceed 50' when duct bank is in a straight line. Shorten intervals as appropriate to accurately identify changes in direction.

Backfill shall be free from large stones, frozen materials, wood, and other extraneous materials.

Place backfill in layers not exceed 6". Thoroughly compact each layer.

Place a plastic marking tape above the duct bank and 12" below finished grade. The plastic tape shall be durable and orange in color clearly indicating that there is a buried Telecommunications Utility Structure below.

3.6 RESTORATION & EROSION PROTECTION

Cut back all concrete and bituminous concrete surfaces 1'-6"

Restore all disturbed footpaths, walkways, sidewalks, driveways and roadways to match existing materials and depths ("Like-for-Like").

Refer to University Design Guide and Standards, Div. 2, Sect 500.A for type and thickness of roadway base surface courses.

When laterally crossing under a concrete sidewalk with a duct bank, replace/restore no less than "Full Square" increments of walkway (i.e. Dummy Joint to Dummy Joint or Dummy Joint to Expansion Joint). Provide a felt expansion joint at each abutting joint.

Refer to University Design Guide and Standards, Div. 2, Sect 500.B for details on concrete paving for permanent sidewalks.

Provide erosion and sediment controls along the entire length of the excavation.

3.7 TESTING & AS-BUILT DOCUMENTATION

Rod and mandrel each conduit and provide a 1250lbs test fabric "Muletape" with distance markings.

Utilizing a 3M "Dynatel" locating tool, identify the duct bank's path by both tracer wire and marker ball methods. The UITs project manager must be present for this test.

Provide as-built Autodesk AutoCAD drawings that accurately provide the following information:

- The installed duct bank's location
- Callouts showing a cross-section detail of each duct bank segment
- Wall-to-wall conduit distances
- Triangulation reference distances from permanent landmarks to points along the duct bank to identify location, changes in direction, changes in configuration, and termination



- GIS coordinates of each Manhole Cover and Utility Marker Ball location along the duct bank's path
- Manhole wall elevation drawings showing conduit identifiers and locations

4 CODE BLUE EMERGENCY TELEPHONES

UConn Department of Public Safety specifies Code Blue Emergency Telephone locations and UITS provides the telephone and cabling. Foundations, conduit pathways, and electrical power for all Code Blue Emergency Phones shall be included in the project's scope and budget.

Provide each Code Blue Telephone with the following:

- 24" diameter X 42" deep concrete foundation. Anchor bolts and template to be provided by UITS.
- One minimum 1" Telecommunication conduit terminating in the ER of the building from where the voice circuit is provided. Provide a pull string, tied off at both ends, labeled "Code Blue"
- One minimum 1" Power conduit to the building from where the voice circuit is provided and one 120VAC 15-amp branch circuit with emergency backup power
- One 5/8" X 8' copper-clad steel ground rod with a #6 AWG copper wire to the base of the Code Blue Phone

Locate the code blue emergency phone so as to be wheelchair accessible from the sidewalk. Install a concrete pad to extend the sidewalk if necessary. Access to the phone shall not be impaired by landscaping of curbs.

Provide UITS with as-built drawings that include conduit locations, electrical panel number and branch circuit information.

Refer to the attached drawing for details.

5 SUPPLEMENTAL DRAWINGS

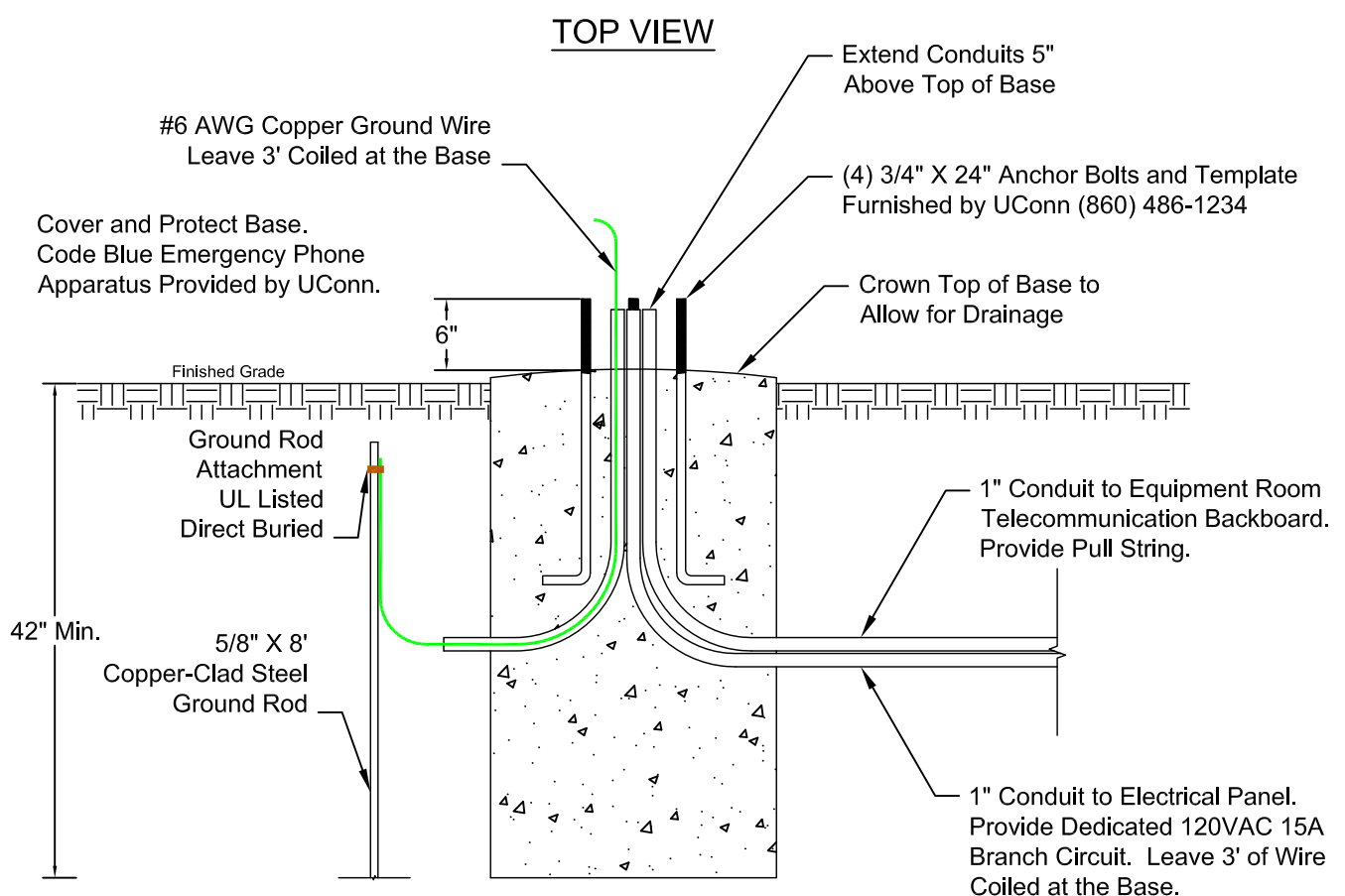
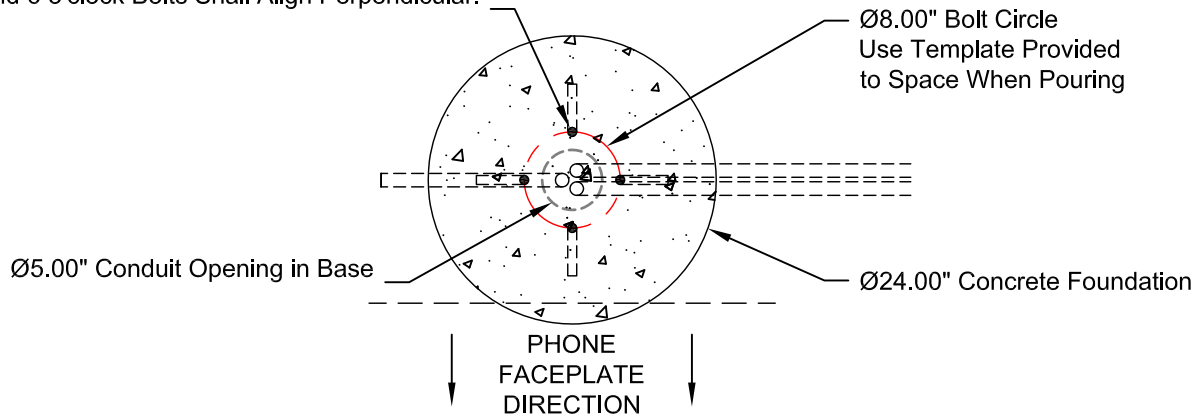
The following detail drawings are included in the Telecommunications Design Guide & Standards to add clarity or supplemental information and as such bear the authority of this document.

LOCATE CODE BLUE EMERGENCY PHONE SO AS TO BE
WHEELCHAIR ACCESSIBLE FROM THE SIDEWALK. INSTALL
CONCRETE PAD TO EXTEND SIDEWALK IF NECESSARY. ACCESS
TO PHONE SHALL NOT BE IMPAIRED BY LANDSCAPING OR CURBS.

Align Bolts in Reference to the Faceplate Direction.

3 o'clock and 9 o'clock Bolts Shall Align Parallel.

12 o'clock and 6 o'clock Bolts Shall Align Perpendicular.



SIDE VIEW



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STORRS, CONNECTICUT

Drawing Name:

CODE BLUE EMERGENCY PHONE BASE DETAIL

Drawn by:

WSV

Date:

MAR 2011

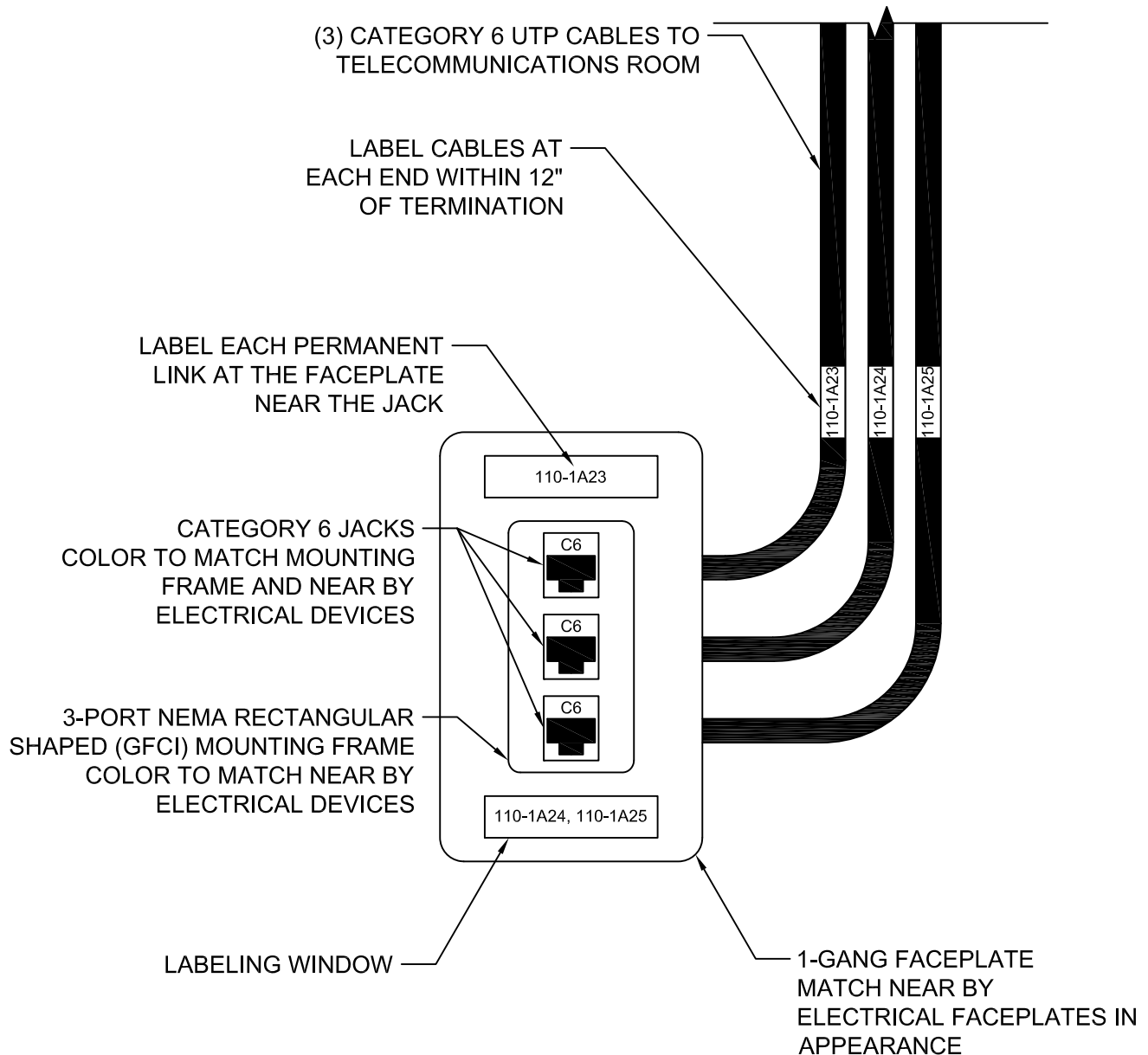
Scale:

3/4" = 1'-0"

Drawing No.:

CB1.1

TEST EACH PERMANENT LINK AS A COMPLETE HORIZONTAL CABLING SYSTEM, WITH JACKS AND FACEPLATES COMPLETELY ASSEMBLED AND PROPERLY MOUNTED. PERFORM PERMANENT LINK FIELD TESTS WITH A LEVEL III FIELD TESTER; IN ACCORDANCE TO TEST UNIT MANUFACTURER INSTRUCTIONS



THE TOPMOST JACK IS TYPICALLY RESERVED FOR VOICE APPLICATIONS AND THE REMAINING JACKS FOR DATA

TERMINATE JACKS TO T568B WIRING SCHEME



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STORRS, CONNECTICUT

Drawing Name:

STANDARD WORK AREA OUTLET DETAIL

Drawing No.:

WAO1.1

Drawn by:

WSV

Date:

MAR 2011

Scale:

NTS

BACKBONE RISER PATHWAY.
PROVIDE LADDER RACK
MOUNTED VERTICALLY ON WALL

UTP COPPER BACKBONE

ISDN WIRING BLOCK

INTRA-TR BACKBONE

ISDN NT1
& POWER SUPPLY

$\frac{1}{4}$ " X 2" X 12" TGB
7'-0" AFF

SEE DWG TR1.4 FOR RACK ELEVATIONS

RACK RACK RACK

#1

#2

#3

SPACE
FOR
FUTURE
RACK

NOTE 1

TERMINATE TV BACKBONE AND
PERMANENT LINKS ON PLYWOOD
BACKBOARD. PROVIDE F81
GROUNDING BLOCKS ALIGNED
VERTICALLY.

$\frac{3}{4}$ " AC PLYWOOD, MOUNTED
FLOOR TO 8'-0" AFF ON TWO WALLS

NOTE 1

TELECOMMUNICATIONS ROOMS SHALL BE DIRECTLY
ACCESSIBLE FROM THE CORRIDOR. DOOR SHALL BE LOCKED
AND KEYED TO UITS REQUIREMENTS.

NOTE 1: SIZE TELECOMMUNICATION ROOMS TO PROVIDE
ENOUGH SPACE FOR ALL EQUIPMENT AND CLEARANCE TO
ALLOW TECHNICIANS TO WORK SAFELY.



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STORRS, CONNECTICUT

Drawing Name:

TELECOMMUNICATIONS ROOM - LAYOUT

Drawing No.:

TR1.1

Drawn by:

WSV

Date:

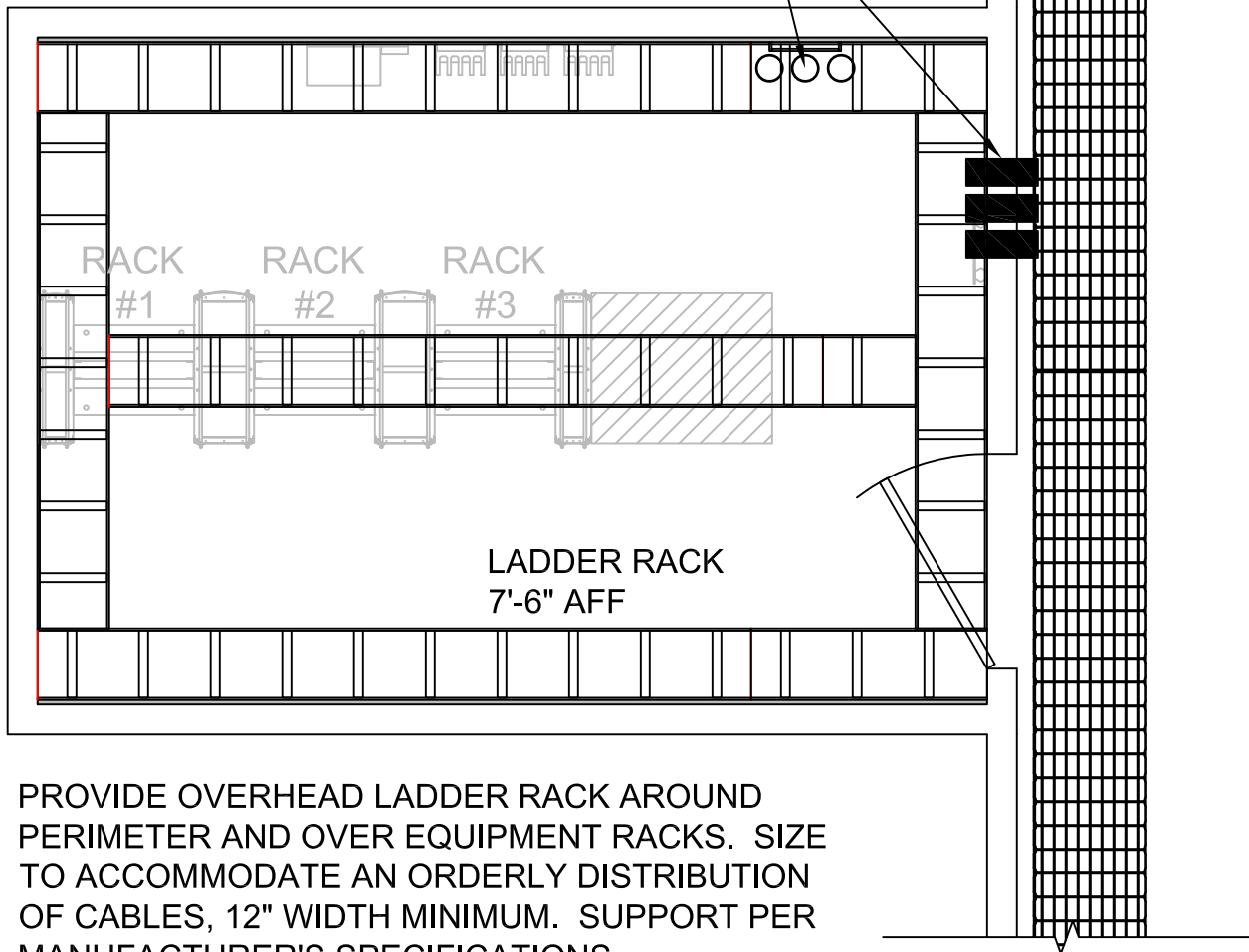
MAR 2011

Scale:

$\frac{3}{8}$ " = 1'-0"

WHERE CABLES AGGREGATE INTO THE
TELECOMMUNICATIONS ROOM, PROVIDE CABLE TRAY.

SLEEVE AND FIRESTOP ALL
WALL AND FLOOR
PENETRATIONS



PROVIDE OVERHEAD LADDER RACK AROUND
PERIMETER AND OVER EQUIPMENT RACKS. SIZE
TO ACCOMMODATE AN ORDERLY DISTRIBUTION
OF CABLES, 12" WIDTH MINIMUM. SUPPORT PER
MANUFACTURER'S SPECIFICATIONS.



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STORRS, CONNECTICUT

Drawing Name:

TELECOMMUNICATIONS ROOM - PATHWAYS

Drawn by:

WSV

Date:

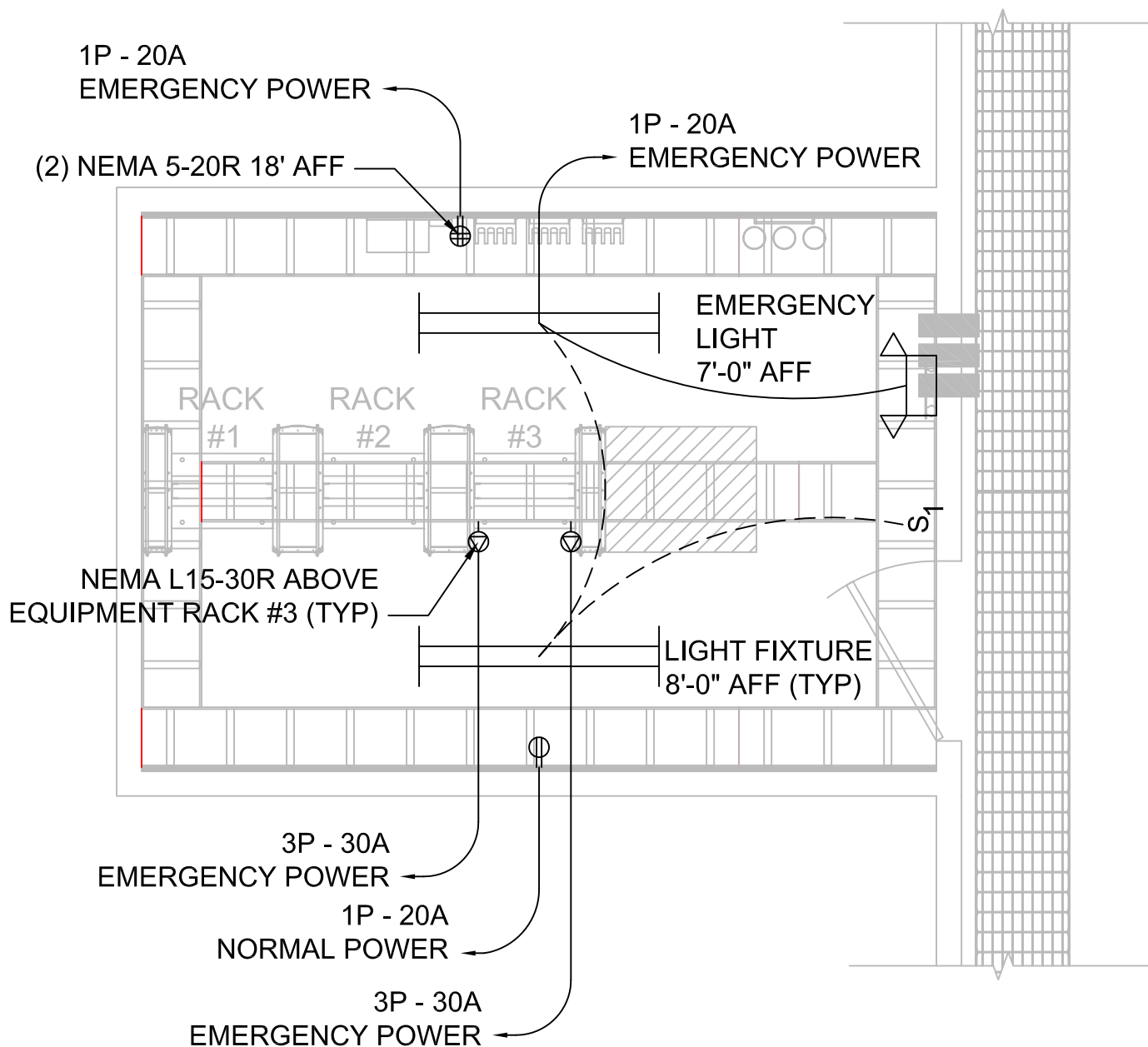
MAR 2011

Scale:

3/8" = 1'-0"

Drawing No.:

TR1.2



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STORRS, CONNECTICUT

Drawing Name:

TELECOMMUNICATIONS ROOM - ELECTRIC

Drawn by:

WSV

Date:

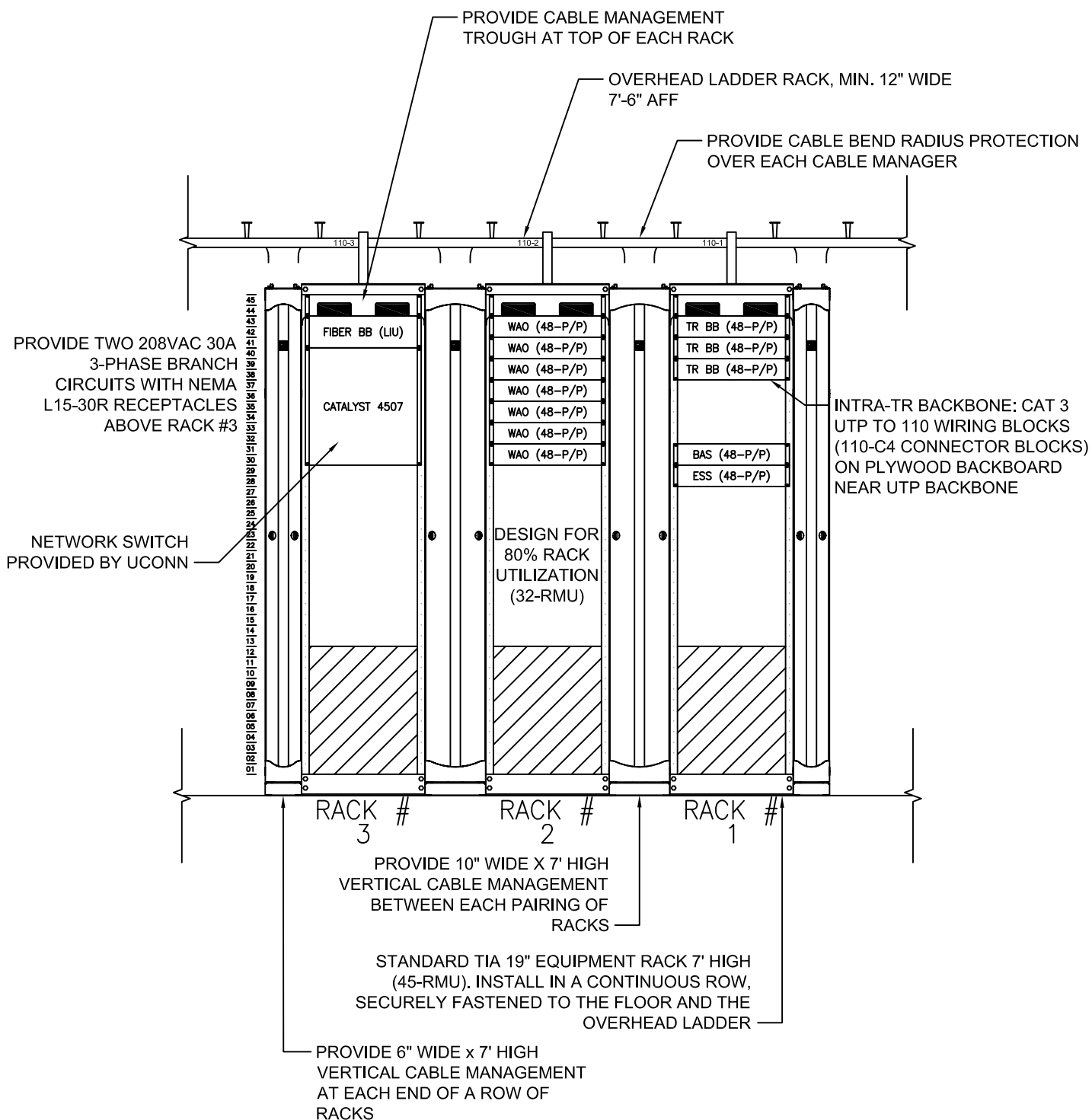
MAR 2011

Scale:

3/8" = 1'-0"

Drawing No.:

TR1.3



PROVISIONING FOR 100 STANDARD (V/D/D) WORK AREA OUTLETS



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Drawing Name:

TELECOMMUNICATIONS ROOM - RACK ELEVATION

Drawing No.:

TR1.4

Drawn by:

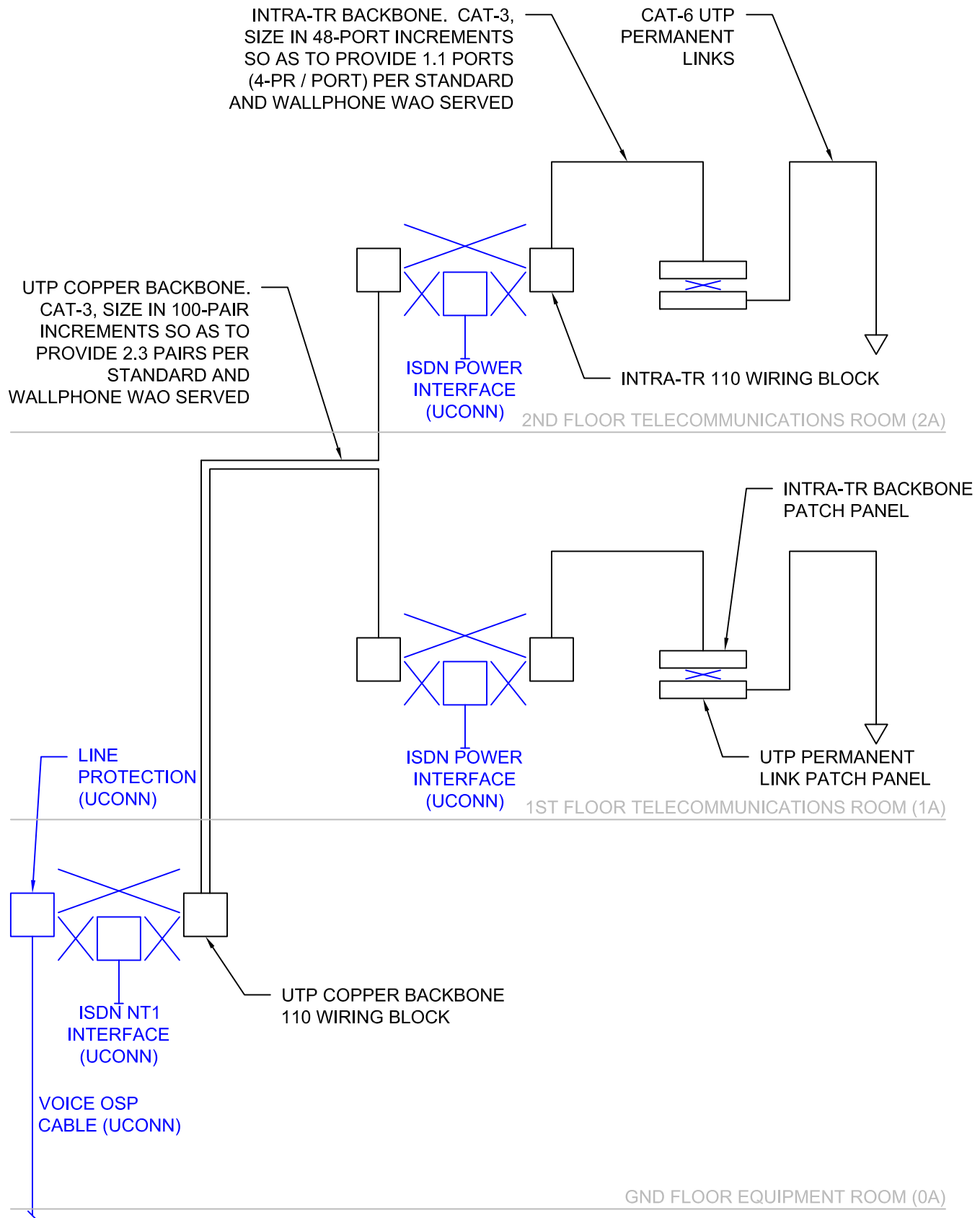
WSV

Date:

MAR 2011

Scale:

1/2" = 1'-0"



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STORRS, CONNECTICUT

Drawing Name:

VOICE RISER DIAGRAM

Drawing No.:

BB1.1

Drawn by:

WSV

Date:

MAR 2011

Scale:

NTS